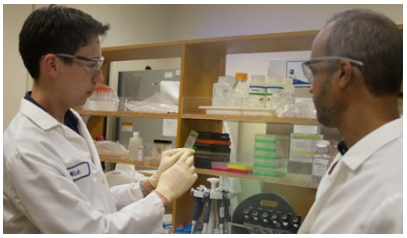
LIVERMORE LAB
REPORT

A weekly compendium of media reports on science and technology achievements at Lawrence Livermore National Laboratory, June 16-20. Though the Laboratory reviews items for overall accuracy, the reporting organizations are responsible for the content in the links below.

San Jose Mercury News

AN ARRAY OF HOPE



Lab scientists Nicholas Be (left) and Jonathan Allen examine the Lawrence Livermore Microbial Detection Array.

Using an advanced DNA-based technology, Lawrence Livermore researchers have detected previously unnoticed bacterial pathogens in the wounds of American soldiers, an advance that could improve medical treatment for combat troops.

As part of a three-year study, Lab scientists -- collaborating with researchers from four other institutions -- used the Lawrence Livermore Microbial Detection Array (LLMDA) to find bacteria in about one-third of wound samples in which standard detection methods, such as a culture, showed no bacteria present.

"The advantage is we can detect bacteria or viruses that are very difficult to detect in the lab using traditional methods," said Livermore Lab biomedical scientist Nicholas Be. "These types of wounds are incredibly complex; there really is a need for faster and more precise diagnostics. Being able to have information about specific species of bacteria is useful; not only does it give you information about the wound, but it also allows you to treat the patient."

For more information, go to the *San Jose Mercury News*.

CHECKING OUT THE BRAIN'S NETWORK

Lawrence Livermore engineer Kedar Shah works on a neural device at LLNL.

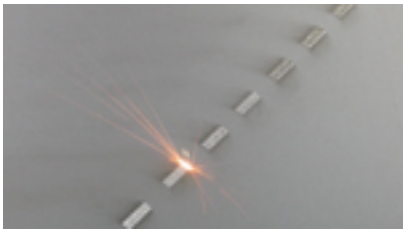
Lawrence Livermore researchers recently received $5.6 million from the Defense Advanced Research Projects Agency (DARPA) to develop an implantable device with the ability to record and stimulate neurons within the brain for treating neuropsychiatric disorders.

The technology will help doctors better understand and treat post-traumatic stress disorder (PTSD), traumatic brain injury (TBI), chronic pain and other conditions.

The project ultimately seeks to reduce the severity of neuropsychological illness in service members and veterans by developing closed-loop therapies that incorporate recording and analysis of brain activity with near-real-time neural stimulation.

To read more, go to *Nanowerk*.

A METALING APPROACH



A direct metal laser melting machine in action: A laser fuses metal powder to form one of many successive layers that will form the final manufactured part.

There are many types of plastic 3D printers that make objects out of plastic, but metal has so far proved a challenging material to manipulate compared to plastic. However, Lawrence Livermore engineers are using lasers to fuse metals together into high quality metal parts.

Selective laser melting (SLM) is a powder-based, additive manufacturing process where a 3D part is produced, layer by layer, using a high-energy laser beam to fuse the metal powder particles. Some SLM applications require parts that are very dense, with less than 1 percent porosity. Pores or voids are the weakest part of the material and most likely would result in failure.

LLNL researchers have developed an efficient approach, based on simple simulations and experiments, to identify optimal parameters to print 3D high-density metal parts. Though the research just looks at a specific kind of stainless steel (316L), the approach could be applied for many other metal powders.

To read more, go to *Knovel*.

PRODUCT DESIGN & DEVELOPMENT JETTING INTO THE FUTURE

Lawrence Livermore researchers are using one of the most powerful supercomputers in the world to help GE build a better jet engine.

At Lawrence Livermore, the world's most powerful computers are working on some of the most fundamental questions about the universe. The Sierra supercomputer, for example, is delving into the Big Bang and trying to figure out why elementary particles have mass.

But Sierra is also solving problems that are closer to home. This supercomputer and more recently the world's second most powerful computer, called Titan, at Oak Ridge National Laboratory in Tennessee, are helping GE engineers build a better jet engine.

Jet engines started out as complicated creatures ever since GE built the first one in the U.S. in 1941, and their design has gotten exponentially more intricate since.

To read more, go to *Product Design & Development*.

ASTROBIOLOGY MAGAZINE

TACKLING THE GIANTS

LLNL researchers and international collaborators have refined estimates of the orbit and size of the exoplanet Beta Pictoris b.

Using one of the world's largest telescopes, a Lawrence Livermore team and international collaborators have tracked the orbit of a planet at least four times the size of Jupiter.

The scientists were able to identify the orbit of the exoplanet, Beta Pictoris b, which sits 63 light years from our solar system, by using the Gemini Planet Imager's (GPI) next-generation, high-contrast adaptive optics (AO) system. This approach is sometimes referred to as extreme AO.

The Gemini Planet Imager snapped an amazingly clear and bright image of the gas giant Beta Pictoris b after an exposure of just one minute.

To read more, go to *Astrobiology Magazine*.

LLNL applies and advances science and technology to help ensure national security and global stability. Through multi-disciplinary research and development, with particular expertise in high-energy-density physics, laser science, high-performance computing and science/engineering at the nanometer/subpicosecond scale, LLNL innovations improve security, meet energy and environmental needs and strengthen U.S. economic competitiveness. The Laboratory also partners with other research institutions, universities and industry to bring the full weight of the nation's science and technology community to bear on solving problems of national importance. To send input to the *Livermore Lab Report*, send e-mail.